

VAA-Weekly-Progress

03/11-03/25

Context

- Last week, completed labelling Visual Keypoints
- Experimented with similar species metrics (limb ratio, centroid variation, DINO)
- Poster deadline for research conference is on April 8

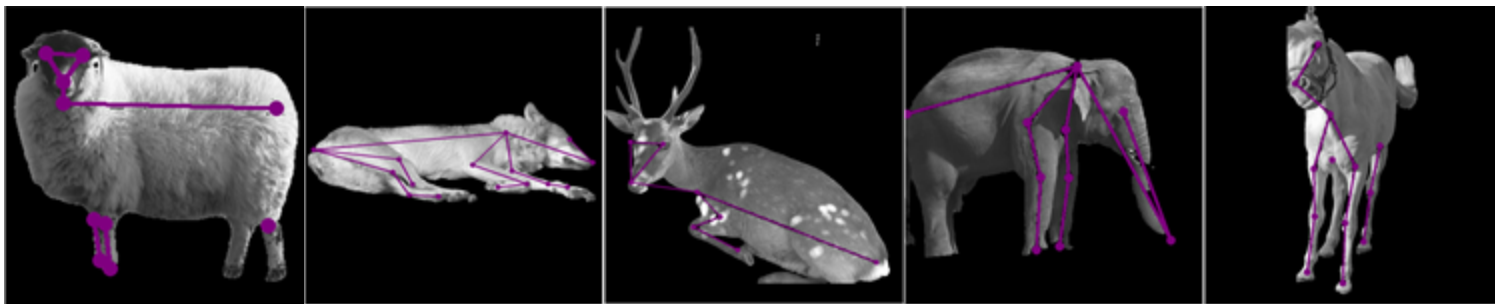
Goals

- Label Biologically defined antelopes - Everyone
- Continue experiments with species similarity
- Rough draft of poster - Medha
- Quick note (we can test on all antelopes (200 images) instead of the 100 being used now - initially we planned on setting aside half the images for finetuning)

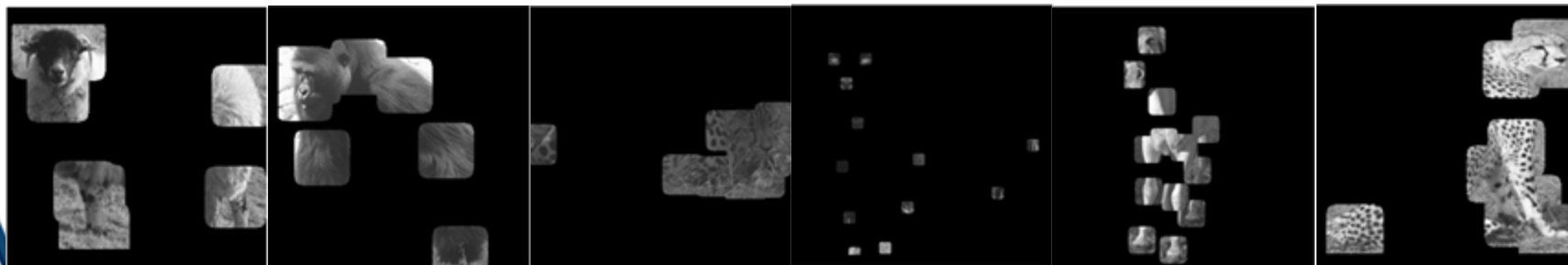
Overlaying KP Skeletons & Masking KP Locations

Hypothesis: Modifying the images with semantics from the labeled key points for the image(either through overlaying the skeleton or only showing the area around the keypoints), could allow the DINO & SD models to generate features that are more meaningful to the keypoint estimation task

Overlaying KP Skeletons:



Masking KP Locations(drew 10 pixel radius circles around each keypoint location for the mask cutouts):



Generated Top 10 Similar Species: Random & Humans

Hypothesis:

We should use a random list of 10 animals as a baseline to see how a model trained on this random list performs to gauge how meaningful the AP and AR results of the models trained on datasets from similarity metrics(centroid variance, DINO+SD features, limb ratios) are.

We could generate a top 10 similar species list based on what species humans(in this case members of the vip team) think look similar to antelopes, to offer either proof that just looking at the visual features(either by humans or extracting them with DINO & SD) is not sufficient to evaluating the similarity of species for keypoint estimation, or that there is something wrong with how features are being extracted and compared with DINO & SD.

Generated Lists: On Next Slide

Top 10 Similar Species Comparison(DINO+SD, Random, Human)

Random	Human Choice	KP Overlay DINO+SD eval w/ cosine sim.	KP Overlay DINO+SD eval w/ knn	KP Patches DINO+SD eval w/ cosine sim.	KP Patches DINO+SD eval w/ knn
<ol style="list-style-type: none"> 1. Tiger 2. Wolf 3. Squirrel 4. Panda 5. Deer 6. Fox 7. Brown Bear 8. Spider Monkey 9. Rhino 10. Mole 	<ol style="list-style-type: none"> 1. Deer 2. Moose 3. Zebra 4. Horse 5. Giraffe 6. Argali Sheep 7. Sheep 8. Cow 9. Bison 10. Buffalo 	<pre> antelope: 1.0000 deer: 0.9176 giraffe: 0.8520 fox: 0.8469 sheep: 0.8412 cheetah: 0.8295 cow: 0.8278 wolf: 0.8273 rabbit: 0.8267 dog: 0.8234 bobcat: 0.8223 buffalo: 0.8211 weasel: 0.8209 argali sheep: 0.8163 leopard: 0.8162 zebra: 0.8129 moose: 0.8114 bison: 0.8091 hippo: 0.8090 monkey: 0.8082 lion: 0.8076 pig: 0.8054 squirrel: 0.8049 polar bear: 0.8048 horse: 0.8004 brown bear: 0.7966 rhino: 0.7954 tiger: 0.7943 elephant: 0.7943 raccoon: 0.7938 spider monkey: 0.7878 panda: 0.7846 rat: 0.7780 mouse: 0.7756 cat: 0.7756 jaguar: 0.7679 skunk: 0.7668 otter: 0.7629 chimpanzee: 0.7591 snow leopard: 0.7573 marmot: 0.7560 beaver: 0.7497 king cheetah: 0.7338 panther: 0.7315 hamster: 0.7311 noisy night monkey: 0.7226 alouatta: 0.7222 black bear: 0.6684 gorilla: 0.6335 </pre>	<pre> Most Similar Species deer: 41 giraffe: 24 rabbit: 13 cheetah: 4 fox: 4 rhino: 3 wolf: 3 sheep: 3 moose: 3 zebra: 2 leopard: 2 polar bear: 2 weasel: 2 argali sheep: 1 hippo: 1 bobcat: 1 bison: 1 </pre>	<pre> antelope: 1.0000 deer: 0.8987 giraffe: 0.8452 zebra: 0.8354 buffalo: 0.8353 bison: 0.8322 argali sheep: 0.8290 sheep: 0.8286 cheetah: 0.8281 cow: 0.8245 fox: 0.8215 rabbit: 0.8202 moose: 0.8175 wolf: 0.8172 elephant: 0.8169 lion: 0.8128 leopard: 0.8100 bobcat: 0.8092 monkey: 0.8084 tiger: 0.8053 weasel: 0.8051 spider monkey: 0.8041 hippo: 0.7995 rhino: 0.7991 squirrel: 0.7975 pig: 0.7921 brown bear: 0.7896 dog: 0.7867 raccoon: 0.7838 polar bear: 0.7770 king cheetah: 0.7737 panda: 0.7735 otter: 0.7734 jaguar: 0.7728 skunk: 0.7728 mouse: 0.7713 horse: 0.7697 beaver: 0.7658 snow leopard: 0.7552 chimpanzee: 0.7547 rat: 0.7541 noisy night monkey: 0.7468 alouatta: 0.7454 cat: 0.7454 marmot: 0.7406 panther: 0.7383 hamster: 0.7312 black bear: 0.6546 gorilla: 0.6457 </pre>	<pre> Most Similar Species deer: 35 giraffe: 20 bison: 12 rabbit: 10 fox: 6 buffalo: 5 argali sheep: 4 cheetah: 3 moose: 3 cow: 3 squirrel: 2 lion: 2 leopard: 1 spider monkey: 1 sheep: 1 rhino: 1 alouatta: 1 </pre>

Top 10 Similar Species Comparison(DINO+SD, Random, Human)

Dino+SD eval
w/ Cosine sim.

```
antelope: 1.0000
deer: 0.9020
giraffe: 0.8387
cheetah: 0.8216
argali sheep: 0.8183
moose: 0.8085
fox: 0.8077
buffalo: 0.8063
sheep: 0.8037
zebra: 0.8018
rabbit: 0.7998
leopard: 0.7968
bobcat: 0.7955
cow: 0.7949
wolf: 0.7895
bison: 0.7894
spider monkey: 0.7894
monkey: 0.7888
weasel: 0.7875
elephant: 0.7798
lion: 0.7752
tiger: 0.7737
squirrel: 0.7781
dog: 0.7674
rhino: 0.7647
hippo: 0.7638
pig: 0.7556
jaguar: 0.7556
brown bear: 0.7549
raccoon: 0.7487
mouse: 0.7487
polar bear: 0.7468
horse: 0.7461
snow leopard: 0.7381
otter: 0.7373
beaver: 0.7351
king cheetah: 0.7341
panda: 0.7317
rat: 0.7257
skunk: 0.7244
marmot: 0.7227
noisy night monkey: 0.7222
cat: 0.7159
chimpanzee: 0.7121
alouatta: 0.7060
panther: 0.6988
hamster: 0.6717
black bear: 0.6236
gorilla: 0.6136
```

Dino+SD eval
w/ knn

```
deer: 35
giraffe: 27
moose: 17
bison: 8
rabbit: 7
cheetah: 4
argali sheep: 4
sheep: 2
zebra: 2
leopard: 2
fox: 1
bobcat: 1
```

KP Overlay
DINO+SD eval w/
cosine sim.

```
antelope: 1.0000
deer: 0.9176
giraffe: 0.8520
fox: 0.8469
sheep: 0.8443
cheetah: 0.8295
cow: 0.8278
wolf: 0.8273
rabbit: 0.8267
dog: 0.8234
bobcat: 0.8223
buffalo: 0.8211
weasel: 0.8209
argali sheep: 0.8163
leopard: 0.8162
zebra: 0.8129
moose: 0.8114
bison: 0.8091
hippo: 0.8090
monkey: 0.8082
lion: 0.8076
pig: 0.8054
squirrel: 0.8049
polar bear: 0.8048
horse: 0.8004
brown bear: 0.7966
rhino: 0.7954
tiger: 0.7943
elephant: 0.7943
raccoon: 0.7938
spider monkey: 0.7878
panda: 0.7846
rat: 0.7708
mouse: 0.7756
cat: 0.7756
jaguar: 0.7678
skunk: 0.7668
otter: 0.7629
chimpanzee: 0.7591
snow leopard: 0.7573
marmot: 0.7560
beaver: 0.7497
king cheetah: 0.7338
panther: 0.7315
hamster: 0.7311
noisy night monkey: 0.7226
alouatta: 0.7222
black bear: 0.6604
gorilla: 0.6335
```

KP Overlay
DINO+SD eval w/
knn

```
Most Similar Species
deer: 41
giraffe: 24
rabbit: 13
cheetah: 4
fox: 4
rhino: 3
wolf: 3
sheep: 3
moose: 3
zebra: 2
leopard: 2
polar bear: 2
weasel: 2
argali sheep: 1
hippo: 1
bobcat: 1
bison: 1
```

KP Patches
DINO+SD eval w/
cosine sim.

```
antelope: 1.0000
deer: 0.8987
giraffe: 0.8452
zebra: 0.8354
buffalo: 0.8353
bison: 0.8322
argali sheep: 0.8298
sheep: 0.8286
cheetah: 0.8281
cow: 0.8245
fox: 0.8215
rabbit: 0.8202
moose: 0.8179
wolf: 0.8172
elephant: 0.8169
lion: 0.8128
leopard: 0.8108
bobcat: 0.8092
monkey: 0.8054
tiger: 0.8053
weasel: 0.8051
spider monkey: 0.8041
hippo: 0.7995
rhino: 0.7991
squirrel: 0.7975
pig: 0.7921
brown bear: 0.7896
dog: 0.7887
raccoon: 0.7838
polar bear: 0.7778
king cheetah: 0.7737
panda: 0.7735
otter: 0.7734
jaguar: 0.7728
skunk: 0.7728
mouse: 0.7713
horse: 0.7697
beaver: 0.7658
snow leopard: 0.7552
chimpanzee: 0.7547
rat: 0.7541
noisy night monkey: 0.7489
alouatta: 0.7454
cat: 0.7454
marmot: 0.7406
panther: 0.7383
hamster: 0.7112
black bear: 0.6546
gorilla: 0.6457
```

KP Patches
DINO+SD eval w/
knn

```
Most Similar Species
deer: 35
giraffe: 20
bison: 12
rabbit: 10
fox: 6
buffalo: 5
argali sheep: 4
cheetah: 3
moose: 3
cow: 3
squirrel: 2
lion: 2
leopard: 1
spider monkey: 1
sheep: 1
rhino: 1
alouatta: 1
```

Fixing Testing Problem With DINO+SD Eval

Problem: Accidentally used the AP and AR scores of the RTMPose model trained on similar species(from DINO+SD features) given when RTMPose is evaluated on the validation set, which is wrong as that includes the animals from similar species list and not antelopes.

Fix: Evaluate it only on the Antelope images from AP10K(use the testing set which only contains the antelope AP10K images).

AP Comparison of RTMPose Trained on Data From:

	Full AP-10k redistributed	Top 10 Dino+SD Full AP-10k Cosine Similarity	Top 10 Dino+SD Full AP-10k KNN	Top 10 KP Overlay Dino+SD Cosine Similarity	Top 10 KP Overlay Dino+SD KNN	Top 10 KP Patches Dino+SD Cosine Similarity	Top 10 KP Patches Dino+SD KNN	Top 10 From Humans	10 Random Species
coco/A P:	0.818	0.791	0.785						
coco/A P .5:	0.969	0.967	0.967						
coco/A P .75	0.884	0.857	0.862						
coco/A P (M):	0.799	0.680	0.753						
coco/A P (L):	0.817	0.793	0.784						

AR Comparison of RTMPose Trained on Data From:

	Full AP-10k redistributed	Top 10 Dino+SD Full AP-10k Cosine Similarity	Top 10 Dino+SD Full AP-10k KNN	Top 10 KP Overlay Dino+SD Cosine Similarity	Top 10 KP Overlay Dino+SD KNN	Top 10 KP Patches Dino+SD Cosine Similarity	Top 10 KP Patches Dino+SD KNN	Top 10 From Humans	10 Random Species
coco/A P:	0.834	0.812	0.809						
coco/A P .5:	0.975	0.971	0.971						
coco/A P .75	0.892	0.873	0.873						
coco/A P (M):	0.817	0.717	0.783						
coco/A P (L):	0.834	0.815	0.810						

Poster Timeline

- Poster session is on April 8 (2 weeks from now)
- We need to have results for the keypoint definition experiments by next week, and also have a finished poster draft by next week for review
- Poster Rough draft in Box

Personal Progress

Medha

- Created a rough draft of the poster
- Labeled 39 images with biological keypoints

Claire

- Labelled 49 images using biological definitions

Parth

- Labeled 20 Images of biological definitions (need to continue; will end up labeling my share of it)
- Worked on drafting species similarity methodology
- Worked on drafting centroid variation algorithm